49. The amplifier of claim 45 wherein the at least two pump sources have a wavelength centered around at least one of about 980nm and 1480nm.

50. The amplifier of claim 45 further comprising at least a second gain optical fiber consisting of one core which contains ions capable of producing stimulated emission of light within the band of wavelengths extending from about 1530 to about 1560nm when pumped with light having a wavelength capable of causing said stimulated emission in said band of wavelengths, said stimulated emission from said gain fiber exhibiting a gain spectrum including a peak around 1532nm and a substantially flat gain region extending from about 1540nm to about 1560nm, said second gain fiber having input and output ends; wherein said at least first and second gain fibers and said filtering fiber are optically interconnected in a series arrangement.

REMARKS

Reissue Claims

Newly added independent claims 21-40 correspond exactly to original claims 1-20, except that the "gain optical fiber" is now limited to a fiber "having only one single-mode core" as contrasted to the original claim limitation "having a single-mode core." It was noted that the original claim limitation could have raised a question as to whether claims 1-20 were limited to

a structure having only one core.

To obviate any questions, patentees have elected to enter claims 21-40 herein that are the same as claims 1-20, respectively, but are limited to a structure having only one core. Such a structure is clearly set forth in the original patent specification and drawings, e.g., see Figs. 1, 4, 10 and 11 and at column 3, line 38, and at column 4, line 67, for example. No new matter is being added and the scope of the claims is not expanded beyond the scope of original claims 1-20.

New claims 41-44 are modifications of original patent claims 1, 17, 19 and 21, respectively. The modifications can best be seen in Appendix A to this paper wherein the words deleted from those original claims are in brackets and the added words are in bold face type. Support for the added matter appears in the footnotes to those claims in Appendix A.

Claims 45-50 are basically new and support for the added matter appears in the footnotes to those claims in Appendix A.

As can be seen, applicants have not added new matter to the added claims and have not expanded the scope of any beyond the scope of the original patent claims 1-20.

Interference No. 104,069

An interference was declared between the applicants Hall et al. original patent and a reissue application of Grasso et al., U.S. Patent No. 5,087,108, a copy of which patent is

enclosed herewith. In that interference, the Hall '069 patent claims 1-2, 10, 12-14 and 17-20 were designated as corresponding to the counts of that interference.

As can be seen in the Grasso '108 patent, the invention thereof is in an optical fiber amplifier having a "double core" fiber. Indeed, in the specification at column 9, lines 30-40, and column 10, lines 56-66, Grasso states that an amplifier made by Grasso from a "single-core" fiber was "practically useless." Such a disclosure clearly teaches away from making an amplifier from a single core fiber and would not in any way teach or suggest applicants' successful construction of a single-core amplifier.

Applicants claims 21-50 are clearly patentable over the art of record and the Grasso patent and an allowance of such claims is earnestly solicited.

Respectfully submitted,

Francis A. Paintin
Registration No. 19,386

Date: June 26, 1998

WOODCOCK WASHBURN KURTZ
MACKIEWICZ & NORRIS LLP
One Liberty Place - 46th Floor
Philadelphia, PA 19103
(215) 568-3100

APPENDIX A

Clarification of Claims 41-50

[1] 41. A fiber amplifier **having a flattened gain spectrum**[1] comprising

a gain optical fiber having [a] **only one** single-mode core, **said core** containing dopant ions capable of producing a **gain spectrum due to** stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, said gain fiber having input and output ends, **and wherein the gain spectrum of said gain optical fiber over said band of wavelengths has a first portion having a relatively small gain variation over a region of said band wavelengths and a second portion having a relatively large gain variation over a different region of said band wavelengths, wherein said first portion of the gain spectrum is relatively flat and wherein said second portion is not flat and exhibits and exhibits a greater gain than the gain exhibited over said relatively flat portion**[2];

[absorbing]ion filtering means for [attenuating]

[1] Col. 1, lines 20, 65-68.

[2] Col. 3, lines 64-67, and Figs. 2, 5-7.

absorbing light within said predetermined band of wavelengths, said [absorbing]ion filtering means having an absorption spectrum having a first portion exhibiting relatively small absorption over said region of said band of wavelengths and a second portion having a relatively large absorption of said different region of said band of wavelengths where the gain spectrum is not flat, said ion filtering means comprising a concentration and distribution of umpumped gain ions within said ion filtering means wherein amplified light having wavelengths within said predetermined band of wavelengths where the gain spectrum is not flat is attenuated to an extent such that the gain spectrum over the entire predetermined band of wavelengths is flattened and exhibits relatively small gain variation over said entire band of wavelengths[3];

means for introducing a signal of wavelength λ_S into said gain fiber input end,

means introducing pump light of wavelength λ_P into said gain fiber, and

means for preventing the excitation of said pumped gain ions by light of wavelength λ_P.

[17] 42. A fiber amplifier comprising

a gain optical fiber having [a] only one single-mode

[3] Col.4, lines 16-48; col. 5, lines 2-17; col. 6, line 61, and col. 7, line 14; and Figs5-6.

core, said core containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_S when pumped with light of wavelength λ_P, said gain fiber having input and output ends, and wherein the gain spectrum of said gain optical fiber, over said band of wavelengths and when pumped with light from wavelength λ_P has a first portion which is relatively flat and a second portion which is not flat and exhibits gain greater than the gain exhibited over said relatively flat portion[4];

filtering means for attenuating light at at least some of the wavelengths within said predetermined band of wavelengths, said filtering means containing ions that can be excited by light of wavelength λ_P, said filtering means having a transmission curve over said predetermined band of wavelengths and in the absence of excitation by said gain fiber over said predetermined band of wavelengths when said gain fiber is excited by light at wavelength λ_P so that when light in the range of said predetermined range of wavelengths is amplified and filtered by said filtering means, the resulting gain spectrum for said amplifier over said predetermined range of wavelengths is substantially flat[5];

means for introducing a signal of wavelength λ_S into

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[4] See footnote 2.

[5] See footnote 3.

said gain fiber input end,

means introducing pump light of wavelength λ_p into said gain fiber, and

means for preventing the excitation of said filtering means by light of wavelength λ_p.

[19] **43.** A fiber amplifier comprising

a gain optical fiber having [a] **only one** single-mode core, **said core** containing dopant ions capable of producing stimulated emission of light within a predetermined band of wavelengths including a wavelength λ_s when pumped with light of wavelength λ_p, said gain fiber having input and output ends, said dopant ions being selected from the group consisting of erbium, neodymium and praseodymium, **and wherein the gain spectrum of said gain optical fiber, over said band of wavelengths and when pumped with light from wavelength λ_p has a first portion which is relatively flat and a second portion which is not flat and exhibits gain greater than the gain exhibited over said relatively flat portion**[6];

filtering means for attenuating light at at least some of the wavelengths within said predetermined band of wavelengths, said filtering means containing a dopant selected from the group consisting of erbium, dysprosium, neodymium, ytterbium, samarium,

[6] See footnote 2.

praseodymium, thulium, vanadium and cadmium selenide, said filtering means having a transmission curve over said predetermined band of wavelengths and in the absence of excitation by said gain fiber over said predetermined band of wavelengths when said gain fiber is excited by light at wavelength λ_P so that when light in the range of said predetermined range of wavelengths is amplified and filtered by said filtering means, the resulting gain spectrum for said amplifier over said predetermined range of wavelengths is substantially flat[7];

means for introducing a signal of wavelength λ_S into said gain fiber input end, and

means introducing pump light of wavelength λ_P into said gain fiber.

New Claims 44-50

44. An optical fiber amplifier having a flattened gain spectrum for use over a wavelength range of about 1530 to about 1560nm comprising:

a gain optical fiber consisting of one core, said containing ions capable of producing stimulated emission of light within the band of wavelengths extending from about 1530 to about

[7] See footnote 3.

1560nm when pumped with light having a wavelength capable of causing said stimulated emission in said band of wavelengths, said stimulated emission from said gain fiber exhibiting a gain spectrum including a peak around 1532nm and a substantially flat gain region extending from about 15460nm to about 1560nm, said gain fiber having input and output ends;

a gain spectrum fiber exhibiting an absorption spectrum and having an input end and an output end, one of the input and output ends of said filtering fiber being optically connected to one of the output and input ends, respectively, of said gain fiber, said filtering fiber having a core doped with ions which are capable of absorbing light according to said absorption spectrum within the band of wavelengths extending from about 1530 to about 1560nm, the absorption spectrum of said filtering fiber having a substantially non-flat absorption spectrum in the spectral region from about 1530 to about 1540nm and particularly at about 1532nm and having a relatively flat absorption spectrum in the region from about 1540 to about 1560nm, the absorption spectrum exhibiting a lower absorption in the region from about 1540 to about 1560nm than the absorption in the spectral region from about 1530 to about 1540nm and particularly at about 1532nm, one of the input and output ends of said filtering fiber being adapted for connection to a transmission fiber input end;

means for introducing pump light into at least one of the input and output ends of said gain fiber; and

means for introducing a light signal having a wavelength in the range from about 1530 to about 1560nm into the input end of said gain fiber wherein said pump light stimulated emission in said gain fiber over the wavelength range from about 1530 to about 1560nm and an amplified signal in the range from about 1530 to about 1540nm is not attenuated below a level about equal to the magnitude of an amplified signal in the wavelength range from about 1540 to about 1560nm[8].

45. The amplifier of claim 44 wherein said means for introducing pump light comprises at least two pump sources[9].

46. The amplifier of claim 44 wherein said amplifier is reverse pumped[10].

47. The amplifier of claim 44 which further comprises means between said gain fiber and said filtering fiber for filtering light in the pump wavelength spectrum[11].

48. The amplifier of claim 44 wherein the pump

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[8] Col. 1, lines 1-9; col. 3, lines 66-68; col. 4, lines 17-49; col. 5 lines 2-16 and line 66, to col. 6, line 8; col. 7, lines 59-60; and Figs. 1, 4, 10-12.

[9] Col. 6, lines 48-60.

[10] See footnote 9.

[11] Col. 4, lines 48-66; col. 5, line 29, to col. 6, line 8.

light has a wavelength centered around at least one of about 980nm and 1480nm[12].

49. The amplifier of claim 45 wherein the at least two pump sources have a wavelength centered around at least one of about 980nm and 1480nm[13].

50. The amplifier of claim 45 further comprising at least a second gain optical fiber consisting of one core which contains ions capable of producing stimulated emission of light within the band of wavelengths extending from about 1530 to about 1560nm when pumped with light having a wavelength capable of causing said stimulated emission in said band of wavelengths, said stimulated emission from said gain fiber exhibiting a gain spectrum including a peak around 1532nm and a substantially flat gain region extending from about 1540nm to about 1560nm, said second gain fiber having input and output ends; wherein said at least first and second gain fibers and said filtering fiber are optically interconnected in a series arrangement[14].

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[12] Col. 5, lines 44-45, and Table 1.

[13] See footnote 12 and col. 5, line 64, to col. 6, line 60.

[14] Col. 6, lines 9-36, and Fig. 10.